

REMARKS**The Specification and Drawings**

Applicants note with appreciation the Examiner's diligence in noting minor informalities in the present application. The specification has been amended to correct typographical errors according to the Examiner's suggestion. The drawings have been objected to because Figure 3 is not discussed on the specification. To address the objection, the paragraph [0022] has been amended to include "Figure 3 shows a graph illustrating a comparison of voltage differences between the bit 12 and bitb line 14 for the sense amplifier 10 shown in Figure 2." Support for the changes can be found in the BRIEF DESCRIPTION OF THE DRAWINGS section. As such, no new matter has been introduced by the amendment.

Claims:

Claims 1-12, 23, 26-28, and 31-32 are currently pending. Claims 13-22 and 33-36, which are drawn to non-elected subject matter, have been canceled in the present amendment without prejudice of or disclaimer to the subject matter of the claims. Applicants reserve the right to pursue these claims in a continuation and/or divisional application. Claims 23 and 28 have been amended to incorporate the subject matter of claims 24-25 and 29-30, respectively, and claims 24-25 and 29-30 consequently being canceled. Applicants respectfully request reconsideration of the application in response to the non-final Office Action.

Claim Rejections – 35 U.S.C. §112

Claims 1, 7, 23, 24, 27, 28, 29, and 32 have been rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite. Claims 1, 7, 23, 27, 28, and 32 have been amended to address the rejection. Claims 1 and 7 have been amended to replace "the memory circuit" with "at least one critical path circuit." Claims 23 and 28 have been amended to replace "the same status" with "a success or failed status." The subject matter of claims 24-25 and 29-30 has been respectively incorporated into claims 23 and 28 to provide allegedly omitted steps, and claims 24-25 and 29-30 consequently being canceled. Claims 26-27 and 31-32 have been amended to reflect the cancellation of claims 24 and 30. Claim 27 has been amended to delete "the" in front of "measured noise." The preamble of claim 23 has been amended to include "a prescribed noise margin," providing antecedent basis for "the prescribed noise margin" of claim 32. Amended claims 23 and 28 respectively include recitations "setting current maximum and minimum values of the parameter to the initial maximum and minimum values of the parameters, respectively" and "set current maximum and minimum values of the parameter to the initial maximum and minimum values of the parameters, respectively" providing antecedent basis for "the current minimum value" and "the current maximum value" therein.

Support for the changes made to claims 1, 7, 23, 27, 28, and 32 can be found throughout the specification and drawings. In light of the changes, Applicants respectfully request withdrawal of the rejection.

Claim Rejections – 35 U.S.C. §101

Claims 1-12 and 23-32 have been rejected under 35 U.S.C. §101 because the claimed invention is allegedly directed to non-statutory subject matter. In rejecting claims 1-12 and 23-32, the Office has stated that "the claims are a recitation of abstract ideas and fail to produce a concrete, useful or tangible result."

Claims 1, 7, 23, and 28 have been amended herein to recite that the methods and computer programs are implemented on a computer, thereby placing the invention recited in Claims 1, 7, 23, and 28 within the technological arts. MPEP §2106.01 (I). Support for the amendment can be found in the specification as originally filed at least at page 4, paragraph [0019]. Since amended independent claims 1, 7, 23, and 28 are directed to statutory subject matter, claims 2-6, 8-12, 26-27, and 31-32, which depend from claims 1, 7, 23, and 28, are also directed to statutory subject matter. Accordingly, withdrawal of the rejection is respectfully requested.

Claim Rejections – 35 U.S.C. §103(a)

Claims 1 and 7 have been rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Laurent ("Sense Amplifier Signal Margins and Process Sensitivities," IEEE Transactions on Circuits and Systems-I: Fundamental Theory and Applications, Volume 49, No. 3, March 2002) in view of Yuan et al. (US Patent 6,249,901). This rejection is respectfully traversed.

The Laurent paper is directed to *determining two signal margins*, "0" and "1", of a sense amplifier based on the time required for the sense amplifier to achieve a given voltage separation. In the Laurent paper, the "1" margin is defined to be V_{DD} -

V_1 , where V_{DD} is a voltage differential on a pair of bit lines and V_1 is the lowest voltage that is recognized as a "1." Also, the "0" margin is defined to be $V_0 - V_{SS}$, where V_0 is the highest voltage that is recognized as a "0" and V_{SS} is a rail voltage amplified by the sense amplifier. To determine the optimal signal margins with charge decay into consideration, the Laurent paper discloses repetition of a series of steps for many initial voltage differentials, wherein the steps includes: 1) maintain the DRAM sensing system at some equilibrium voltage; 2) apply an initial voltage differential to the bitlines by turning on wordlines; 3) take the sense amplifier through a standard sense-and-restore operation; and 4) amplify the voltage differential so that one bitline is near V_{DD} while the other is near V_{SS} . In marked contrast, certain embodiments of the present invention include method steps for simulating a circuit design to verify the signal strength of bit lines. For a given memory circuit design, circuit elements are identified and one or more critical path circuits are extracted from the identified circuit elements. Subsequently, the critical path circuit is simulated, and the maximum voltage difference between bit lines of a sense amplifier is measured and compared to a *prescribed noise margin* to verify the signal strength of the bit lines. Apparently, the Laurent paper has little to do with the presently claimed invention, nor does it teach the steps recited in claims 1 and 7. As correctly noted by the Office, the Laurent paper fails to teach the steps of identifying circuit elements of the memory circuit design and extracting a critical path circuit from the circuit elements. Also, even though the Laurent paper discloses the steps of applying known voltage differential and amplifying the voltage differential to check if voltages of bit lines are near V_{DD} and V_{SS} , it fails to teach the step of measuring the maximum voltage difference between bit lines in the sense of the

present application. Perhaps, more importantly, the Laurent is silent as to the prescribed noise margin, much less the step of comparing the maximum voltage difference between bit lines to a prescribed noise margin. The Yuan et al. patent is similar in this regard.

The Yuan et al. patent is applied only to teach the steps of identifying circuit elements, extracting memory circuit path from the circuit elements and simulating the memory circuit. The Yuan et al. patent discloses an automatic memory characterization system that provides improved accuracy in determining timing characteristics of a circuit. The system includes various tools to receive a memory circuit netlist, to perform an automatic circuit reduction process, to generate a specification file based on a data sheet, to generate an updated stimulus, to generate an updated critical path netlist, and to perform at least one circuit simulation process based on the updated critical path netlist. Apparently, the Yuan et al. patent has little to do with the presently claimed invention. A review of the Yuan et al. patent reveals that, as in the case of the Laurent paper, it is silent as to measuring the maximum voltage difference between bit lines and comparing the maximum voltage difference between bit lines to a prescribed noise margin to verify the signal strength of the bit lines.

The combination of teachings in the Laurent paper and Yuan et al. patent is not obvious. As set forth above, the Laurent paper is directed to finding two signal margins of a sense amplifier associated with DRAM(s), while the Yuan et al. patent is directed to determining timing characteristics of a circuit having a large number of elements. It is not clear how the steps of the Laurent paper for finding signal margins can be performed in the Yuan et al system so as to verify the signal strength

of bit lines. Nor would it be logical to modify the method steps of Laurent paper to further include steps of identifying circuit elements of the memory circuit and extracting a memory circuit path insofar as the Laurent method steps are performed on a given system (page 270, section II, paragraph 1) and, as a consequence, these two steps are not needed to determine the two signal margins. In sum, if one were to read the Laurent paper and Yuan et. al patent without the benefit of Applicants' own disclosure, one would see that they are incompatible with another and that there is no reason to modify one to reflect features of the other to arrive at Applicants' claimed invention.

To further differentiate from the cited references, claims 1 and 7 have been amended to recite "a prescribed noise margin." Support for the changes can be found in the specification, page 8, paragraphs [0027], [0028] and claim 27, for instance. In light of the reasons set forth above and the changes, Applicants respectfully submit that a *prima facie* case of obviousness has not established, and that claims 1 and 7 are patentable.

Claims 2-6 and 8-12 have been rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Laurent in view of Yuan et al. as applied to claims 1 and 7, and further in view of Sandhu (US Patent 5,521,874).

This rejection is predicated on the erroneous characterization of the Laurent paper and Yuan et al. patent, which is respectfully traversed, as pointed out above. Accordingly, Applicants respectfully submit that the rejection of claims 2-6 and 8-12 lacks foundation and should be withdrawn.

Claims 23-32 have been rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over yuan et al. in view of Poon ("Computer Circuits Electrical Design," Prentice Hall Inc., 1995, pages 63-69, 195-196, 220-221)

In rejecting claims 23 and 28, the Office has stated that "Yuan et al. teaches: identifying circuit elements to be characterized ... and ceasing simulation if both simulations indicate the same status (column 20, lines 33-47). Applicants respectfully disagree.

As discussed above, the Yuan et al. patent is silent as to a prescribed noise margin, wherein a measured noise is compared to the prescribed noise margin to check the status of simulation. To further differentiate from the cited references, claims 23 and 28 have been respectively amended to recite "[a] computer-implemented method of characterizing a minimum circuit parameter sensitive to a noise disturbance against a prescribe noise margin in a circuit design" and "[a] system for characterizing a minimum value of circuit parameter against a prescribed noise margin." A review of cited references reveals that the cited references fail to teach or suggest, taken individually or in combination, the prescribed noise margin. As such, Applicants respectfully submit that Applicants respectfully submit that a *prima facie* case of obviousness has not established, and that claims 23 and 28 are patentable. Claims 26-27 and 31-32 depend from claims 23 and 28; rendering them also patentable for at least the same reasons.

In rejecting claims 27 and 32, the Office has correctly noted that the Yuan et al. patent does not teach the characterizing a circuit parameter sensitive to a noise disturbance against a noise margin in a circuit design. Then, to overcome the

deficiency in teaching characterizing a circuit parameter sensitive to a noise disturbance against a noise margin in a circuit design, the Office has relied on the Poon as follows:

Poon teaches that device noise margin varies across device samples due to process variations and because of this, the range of the device noise margin must be taken into account in setting up circuit rules and careful attention must be paid to all aspects of noise analysis to maintain system reliability (page 64). Poon further teaches existing software that is used interactively for on-line feedback of layout decisions ... It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of characterizing parameter as taught in Yuan et al. to include characterizing the circuit parameter in view of a noise margin since Poon teaches that device noise margin varies across device samples....

This rejection is respectfully traversed. Poon does disclose two types of device noise margins: DNM_h and DNM_l . DNM_h is the difference between driver output voltage at HIGH state and receiver input voltage at HIGH state. DNM_l is the difference between driver output voltage at LOW state and receiver input voltage at LOW state. Apparently, the two device noise margins, which appear to be viewed by the Office to correspond to the prescribed noise margin, are different from the prescribed noise margin of the presently claimed invention, wherein, in the presently claimed invention, the simulation status, fail or success, is determined by comparison of noise disturbance with the prescribe noise margin . In fact, Poon merely describes two device noise margins and is silent as to determining the status of simulation using the prescribed noise margin. With regard to crosstalk parameters, Poon discloses SigNoise that is used interactively for on-line feedback of layout decisions, or in batch mode to analyze a complete design, save the results, and interactively review individual sources of signal distortion, highlighting nets that

violate user-defined noise margins. Again, both SigNoise and the user-defined noise margin has little with the prescribe noise margin in the sense of the present invention. A review of the cited references reveals that the cited references fail to teach or suggest, taken individually or in combination, "the simulation indicates a failed status if a measured noise is above a prescribed noise margin" as recited in claims 27 and 32. Applicants respectfully submit that a *prima facie* case of obviousness has not established, and that claims 27 and 32 are patentable.

Conclusion

Based on the reasons as set forth above, Applicants respectfully request allowance of all pending claims.

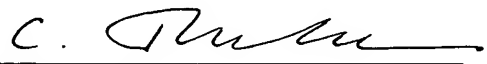
In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

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Date: January 10, 2007

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